

## Claims

1. Method for the mechanised manufacture of tied dough blanks composed of dough strands, in particular of pretzel blanks,

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wherein in a first step a dough strand (46) is received by the dough strand ends (46a) by a tying head (9) of a dough-tying device, which is in a gripping position (48),

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wherein in a second step the dough strand (46) is stretched in its longitudinal direction by a degree of stretch (d),

wherein in a third step the tying head (9) is moved into a tying position (51) and/or is rotated, the dough strand (46) being tied, and

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wherein in a fourth step the tying head (9) is moved into a depositing position (52) in which the dough strand ends are deposited on the rest of the dough strand,

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characterised in that in the second step the tying head (9) with the dough strand ends (46a) is moved from the gripping position (48) into a stretching position (49), and the dough strand intermediate section is held between the dough strand ends (46a) by means of a stationary stop (5, 6).

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2. Method according to claim 1, characterised in that a tension generated during the second or stretching step is maintained in the dough strand (46) during the third or tying step wholly or in part, e.g. at least during the first three-quarter turn of the tying head (9)

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3. Method according to claim 2, characterised in that in order to maintain this tension, in the third step knot-tying guide means (10, 11) are used, which form a guide passage.
- 5 4. Method according to claim 1, 2, or 3, characterised in that in the second or stretching step the tying head (9) with the dough strand ends (46a) is removed (50) from the stop (5, 6) in or according to a dough strand conveying direction (35).
- 10 5. Method according to claim 4, characterised in that in the course of removal (50), a component of motion transverse to the dough strand conveying direction (35) is superimposed on the tying head (9).
- 15 6. Method according to claim 4 or 5, characterised in that in the third step, in order to reach the tying position (51), the tying head (9) is moved (23) with the dough strand ends (46a) counter to the dough strand conveying direction (35).
- 20 7. Method according to one of the preceding claims, characterised in that in the fourth step, in order to reach the depositing position (52) the tying head (9) with the dough strand ends (46a) is moved (53) counter to the dough strand conveying direction (35).
- 25 8. Method according to claim 7, characterised in that in the course of reaching (53) the depositing position (52) a component of motion transverse to the dough strand conveying direction (35) is superimposed on the tying head (9) in order to approach the dough strand intermediate section between the dough strand ends (46a).
- 30 9. Apparatus for the mechanised manufacture of tied dough products, in particular pretzels, for carrying out the method according to one of the preceding claims,

comprising a shaping table (2) for supporting a curved dough strand (46) with an activatable shaping tool (6) for the abutment of the curved dough strand (46) transverse to the support direction, wherein the shaping table (2) and the activated shaping tool (6) form a common shaping stop for the curved dough strand (46),

and comprising a tying head (9) for grasping the dough strand ends and tying the dough strand (46),

characterised in that

the tying head (9) is so guided and connected to one or more actuators (15; 27, 28) that the tying head (9) may be moved from a gripping position (48), in which the dough strand ends of the curved dough strand (46) are grasped, to a stretching position (49) in which the dough strand (46) is stretchable in combination with the common shaping stop and

in that the common shaping stop is formed stationary or fixed with respect to a dough strand conveying direction (35).

10. Apparatus according to claim 9, characterised in that the tying head (9) is so guided and connected to the actuator(s) (15) that the tying head (9) is movable (23) from the stretching position – optionally already combined with tying of the dough strand – into a tying position (51) in which the dough strand may be knotted.

11. Apparatus according to claim 10, characterised in that the tying head (9) is so guided and connected to the actuator(s) (15, 28) that the tying head (9) is movable (53) from the tying position (51) into a depositing position (52) in which the dough strand ends may be deposited on the dough strand intermediate section.

12. Apparatus according to one of the preceding claims, characterised in that the shaping tool (6), in particular with pins (5) and/or other holding bodies, may be moved in and/or counter to the dough strand conveying direction (35) in a steady manner and may be moved only in one direction (44, 45) transverse or obliquely thereto.

13. Apparatus according to one of the preceding claims, wherein one (15) of the actuators (15; 27, 28) of the tying head (9) is guided parallel to the conveying direction (35), characterised in that this actuator (15) is formed with an electrical servo or stepper motor (16).

14. Apparatus according to claim 13, characterised in that the actuator (15) with the servo or stepper motor (16) is so arranged by circuit or programming technology that the tying head (9) may be moved from the gripping position (48) into a stretching position (49) which may be preset in a variable manner.

15. Apparatus according to claim 13 or 14, characterised in that the actuator (15) has a linear guide (18, 19) which is coupled to the servo or stepper motor (16) and which extends parallel to the dough strand conveying direction (35) and beyond an outlet of the shaping table (2) facing in the conveying direction (35).

16. Apparatus according to one of the preceding claims, wherein one or more sensors (38, 39) are provided to detect the dough strand ends of the curved dough strands (46), characterised in that the measuring position of the sensor(s) (38, 39) is formed on the shaping table (2).

17. Apparatus according to claim 16, characterised by a sensor measuring position such that the dough strand ends of the curved dough strand (46) lying on the shaping table (2) are detectable with the sensors (38, 39).

18. Apparatus according to claim 16 or 17, characterised in that in the dough strand conveying direction (35) the gripping position (48) is in sequence with the measuring position.

5 19. Apparatus according to one of claims 16 to 18, wherein the shaping table has one or more conveying strands (3, 4) and associated deflection sheaves, around which the conveying strands pass, characterised in that the sensor(s) (38, 39) are disposed immediately above the one or more deflection sheaves of the conveyor belts (3, 4) positioned to the rear in the conveying direction  
10 (35).

20. Apparatus according to one of claims 16 to 19, characterised in that two sensors (38, 39) are disposed at the sides of the shaping table (2) diametrically opposed or otherwise opposite one another, so that a  
15 measuring line and/or a measuring plane is formed at least in parts parallel to the shaping table (2) and transverse or oblique to the dough strand conveying direction (35), the sensors (38, 39) being disposed in the starting region or in the last half of the shaping table (2) in the conveying direction (35).

20 21. Apparatus according to one of the preceding claims, wherein the actuators (15, 16; 25; 27, 28) of the tying head (9) comprise a rotary drive (25), characterised in that the rotary drive (25) is made to be programme-controlled with a servo or stepper motor.

25 22. Apparatus according to one of the preceding claims, wherein the actuators (15, 16, 17; 25; 27, 28) of the tying head (9) comprise a rotary drive (25), characterised in that its axis of rotation (57) is formed as an endless rotary axis and permits rotation of the tying head (9) through 360° and/or 720°  
30 and/or through plural revolutions, a rotary duct being provided for passing through the control signals and supply currents for the tying head and/or its rotary drive (25).

23. Apparatus according to one of the preceding claims, characterised in that the actuator(s) (15, 16; 25; 27, 28) are connected to a control, which is so arranged in terms of circuit and/or programming technology that sets of  
5 parameters may be stored and/or retrieved, which comprise the number of rotations of a rotary drive (25) for the tying head (9) and/or the degree of stretch (d) and/or the coordinates of a gripping, stretching, tying and/or depositing position for the actuator (15) and optionally other drives of the tying head (9).

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24. Apparatus according to claim 23, characterised in that the control is so arranged in terms of circuit and programming technology that all or some of the control parameter sets mentioned are referenced via a dough product data encryption key.

**Altered claims [received at the International Office on 23 August 2005;  
original claims 1-24 replaced by altered claims 1-24 (8 pages)]**

1. Method for the mechanised manufacture of tied dough blanks composed of  
5 dough strands, in particular of pretzel blanks,

wherein in a first step a dough strand (46) is received by the dough  
strand ends (46a) by a tying head (9) of a dough-tying device, which is in  
a gripping position (48),

10 wherein in a second step the dough strand (46) is stretched in its  
longitudinal direction by a degree of stretch (d), the tying head (9) with  
the dough strand ends (46a) is moved from the gripping position (48) into  
a stretching position (49), and the dough strand intermediate section is  
15 held between the dough strand ends (46a) by means of a stationary stop  
(5, 6),

wherein in a third step the tying head (9) is moved into a tying position  
(51) and/or is rotated, the dough strand (46) being tied, and

20 wherein in a fourth step the tying head (9) is moved into a depositing  
position (52) in which the dough strand ends are deposited on the rest of  
the dough strand,

25 characterised in that in the second step a control which may be set by  
programme and/or circuit technology is used with an actuator (15) for the tying  
head (9), in the case of which control or actuator the degree of stretch (d) may  
be preset in a variable manner.

30 2. Method for the mechanised manufacture of tied dough blanks composed of  
dough strands, in particular of pretzel blanks,

wherein in a first step a dough strand (46) is received by the dough strand ends (46a) by a tying head (9) of a dough tying device, which is in a gripping position (48),

5 wherein in a second step the dough strand (46) is stretched in its longitudinal direction by a degree of stretch (d), the tying head (9) with the dough strand ends (46a) is moved from the gripping position (48) into a stretching position (49), and the dough strand intermediate section is held between the dough strand ends (46a) by means of a stationary stop  
10 (5, 6),

wherein in a third step the tying head (9) is moved into a tying position (51) and/or is rotated, the dough strand (46) being tied, and

15 wherein in a fourth step the tying head (9) is moved into a depositing position (52) in which the dough strand ends are deposited on the rest of the dough strand,

20 characterised in that by means of one or more sensors (38, 39) the dough strand ends (46a) of the dough strands (46) are detected in a measuring position located upstream of the gripping position (48) viewed in the conveying direction (35), and thereupon the grasping of the dough strand ends by the tying head (9) is triggered.

25 3. Method according to claim 1 or 2, characterised in that a tension generated during the second or stretching step is maintained in the dough strand (46) during the third or tying step wholly or in part, e.g. at least during the first three-quarter turn of the tying head (9).

30 4. Method according to claim 3, characterised in that in order to maintain this tension in the third step knot-tying guide means (10, 11) are used, which form a guide passage.



5. Method according to one of the preceding claims, characterised in that in the second or stretching step, the tying head (9) with the dough strand ends (46a) is removed (50) from the stop (5, 6) in or according to a dough strand conveying direction (35).
6. Method according to claim 5, characterised in that in the course of removal (50), a component of motion transverse to the dough strand conveying direction (35) is superimposed on the tying head (9).
7. Method according to claim 5 or 6, characterised in that in the third step, in order to reach the tying position (51), the tying head (9) is moved (23) with the dough strand ends (46a) counter to the dough strand conveying direction (35).
8. Method according to one of the preceding claims, characterised in that in the fourth step, in order to reach the depositing position (52), the tying head (9) with the dough strand ends (46a) is moved (53) counter to the dough strand conveying direction (35).
9. Method according to claim 8, characterised in that in the course of reaching (53) the depositing position (52) a component of motion transverse to the dough strand conveying direction (35) is superimposed on the tying head (9) in order to approach the dough strand intermediate section between the dough strand ends (46a).
10. Apparatus for the mechanised manufacture of tied dough products, in particular pretzels, for carrying out the method according to one of the preceding claims,
- comprising a shaping table (2) for the support of a curved dough strand (46) with an activatable shaping tool (6) for the abutment of the curved

dough strand (46) transverse to the support direction, wherein the shaping table (2) and the activated shaping tool (6) form a common shaping stop for the curved dough strand (46),

5 and comprising a tying head (9) for grasping the dough strand ends and tying the dough strand (46),

wherein the tying head (9) is so guided and connected to one or more actuators that the tying head (9) is movable from a gripping position (48) in which the dough strand ends of the curved dough strand (46) are grasped,  
10 to a stretching position (49) in which the dough strand (46) is stretchable in combination with the stop, and

wherein the common shaping stop is formed stationary or fixed with respect  
15 to a dough strand conveying direction (35),

characterised in that one (15) of the actuators (15; 27, 28) of the tying head (9) is so arranged by circuit or programming technology that the tying head (9) may be moved from the gripping position (48) into a stretching position  
20 (49) which may be preset in a variable manner.

11. Apparatus according to claim 10, characterised in that the actuator (15) arranged by circuit or programming technology for presetting the stretching position (49) in a variable manner is guided parallel to the conveying  
25 direction (35) and/or is formed with an electric servo or stepper motor (16).

12. Apparatus according to claim 11, characterised in that the actuator (15) has a linear guide (18, 19) which is coupled (17,22) to the servo or stepper motor (16) and which extends parallel to the dough strand conveying  
30 direction (35) and beyond an outlet of the shaping table (2) facing in the conveying direction (35).

13. Apparatus for the mechanised manufacture of tied dough products, in particular pretzels, for carrying out the method according to one of the preceding claims,

5 comprising a shaping table (2) for supporting a curved dough strand (46),

comprising an activatable shaping tool (6) for the abutment of the curved dough strand (46) transverse to the support direction, wherein the shaping table (2) and the activated shaping tool (6) form a common shaping stop for  
10 the curved dough strand (46),

and comprising a tying head (9) for grasping the dough strand ends and tying the dough strand (46),

15 wherein the tying head (9) is so guided and connected to one or more actuators (15; 27, 28) that the tying head (9) is movable from a gripping position (48) in which the dough strand ends of the curved dough strand (46) are grasped, to a stretching position (49) in which the dough strand (46) is stretchable in combination with the stop, and

20 wherein the common shaping stop is formed stationary or fixed with respect to a dough strand conveying direction (35),

25 characterised in that in order to detect the dough strand ends (46a) of the curved dough strands (46) one or more sensors (38, 39) are provided, whose measuring positions are upstream of the gripping position (48) in the conveying direction (35).

14. Apparatus according to claim 13, characterised in that the respective  
30 measuring position of the sensor(s) (38, 39) is formed on the shaping table (2).

15. Apparatus according to claim 14, characterised by a sensor measuring position such that the dough strand ends (46a) of the curved dough strand (46) lying on the shaping table (2) may be detected by the sensors (38, 39).

5 16. Apparatus according to one of claims 13 to 15, wherein the shaping table has one or more conveying strands (3, 4) and associated deflection sheaves around which the conveyor strands pass, characterised in that the sensor(s) (38, 39) are disposed immediately above the one or more deflection sheaves of the conveyor strands (3, 4) positioned to the rear in the conveying direction  
10 (35).

17. Apparatus according to one of the preceding claims, characterised in that the tying head (9) is so guided and connected to the actuator(s) (15) that the tying head (9) may be moved (23) from the stretching position into a tying  
15 position (51) in which the dough strand may be knotted.

18. Apparatus according to claim 17, characterised in that the tying head (9) is so guided and connected to the actuator(s) (15) that the tying head (9) may be moved (53) from the tying position (51) into a depositing position (52) in  
20 which the dough strand ends may be deposited on the dough strand intermediate section.

19. Apparatus according to one of the preceding claims, characterised in that the shaping tool (6), in particular with pins (5) and/or other holding bodies,  
25 may be moved steadily in and/or counter to the dough strand conveying direction (35) and only in one direction (44, 45) transverse or oblique thereto.

20. Apparatus according to one of the preceding claims, characterised in that two sensors (38, 39) are disposed at the sides of the shaping table (2)  
30 diametrically opposed or otherwise opposite one another, so that a measuring line and/or a measuring plane is formed at least in parts parallel to the shaping table (2) and transverse or oblique to the dough strand

conveying direction (35), the sensors (38, 39) being disposed in the starting region or in the last half of the shaping table (2) in the conveying direction (35).

- 5 21. Apparatus according to one of the preceding claims, wherein the actuators (15, 16; 25; 27, 28) of the tying head (9) comprise a rotary drive (25), characterised in that the rotary drive (25) is formed to be programme-controlled with a servo or stepper motor.
- 10 22. Apparatus according to one of the preceding claims, wherein the actuators (15, 16, 17; 25; 27, 28) of the tying head (9) comprise a rotary drive (25), characterised in that its axis of rotation (57) is formed as an endless rotary axis and permits rotation of the tying head (9) through 360° and/or 720° and/or through plural revolutions, a rotary duct being provided for passing  
15 through the control signals and supply currents for the tying head and/or its rotary drive (25).
23. Apparatus according to one of the preceding claims, characterised in that the actuator(s) (15; 25; 27, 28) are connected to a control, which is so  
20 arranged in terms of circuit and/or programme technology that sets of parameters may be stored and/or retrieved, which comprise the number of rotations of a rotary drive (25) for the tying head (9) and/or the degree of stretch (d) and/or the coordinates of a gripping, stretching, tying and/or depositing position for the actuator (15) and optionally other drives of the  
25 tying head (9).
24. Apparatus according to claim 23, characterised in that the control is so formed by circuit and/or programme technology that all or some of the control parameter sets mentioned are referenced via a dough product encryption  
30 key.

## **Declaration in accordance with Article 19 (1) PCT**

The new claims with their alterations arise from the application documents in the version originally filed, as follows:

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1. The respective preamble of the independent method claims 1 and 2 and of the independent apparatus claims 10 and 13 corresponds to the original claims 1 and 9. Thus the specification D1: DE 17 82 289 A1 is to be taken into account.

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2. The characterising part of the altered claim 1 goes back to paragraphs [0029], [0054] at the end, and [0061] at the start of the original description. In particular, the original claim 14 is referred to.

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3. The characterising part of the altered claim 2 arises from the paragraphs [0026], [0049] and [0060] of the original description and from the original claim 18.

4. The altered claims 3-9 correspond to the original claims 2-8.

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5. The characterising part of the altered claim 10 arises from the original claim 14.

6. The altered claim 11 arises from the original claim 13.

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7. The altered claim 12 arises from the original claim 15.

8. The characterising part of the altered claim 13 arises from paragraphs [0025] and [0026] of the original description or from the original claims 16 and 18.

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9. The altered claims 14-16 arise from the original claims 16, 17 and 19.

10. The altered claims 17-19 arise from the original claims 10-12.

11. The altered claims 20-24 arise from the original claims 20-24.

5 The content of the Application in the originally filed version is reserved.